Science Diplomacy in CEI Member States

BRIDGING EUROPE SINCE 1989

CEI
CENTRAL EUROPEAN INITIATIVE

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Foreword

2019 marked the 30th anniversary of the Central European Initiative (CEI), whose origins date back to the end of the Cold War. It was on 11 November 1989, two days after the fall of the Berlin Wall, that the Ministers of Foreign Affairs of four countries - Italy (member of NATO), Austria (neutral), Hungary (member of the Warsaw Pact) and former Yugoslavia (leader of the Non-Aligned Movement) – met in Budapest and established the Quadrilateral Initiative, the first attempt to overcome the bipolar order through regional cooperation.
A joint declaration was released after the meeting, stating that "the development of sub-regional, regional and inter-regional cooperation could significantly contribute to the gradual creation of a common economic area [...] in Europe".

Since then, the membership of the CEI, as it was renamed in 1992, has grown steadily. It currently encompasses seventeen countries, of which nine EU Members (Bulgaria, Croatia, Czech Republic, Hungary, Italy, Poland, Romania, Slovakia and Slovenia), five accession countries (Albania, Bosnia and Herzegovina, Montenegro, North Macedonia and Serbia) and three Eastern neighbours (Belarus, Moldova and Ukraine).
This large constituency shares a strong commitment towards the implementation of the CEI political mission, i.e. to support the process of European integration and promote sustainable development through cooperation between and among its Member States and with the European Union, international and regional organisations, as well as with other public or private institutions and non-governmental organisations.
To this aim, over the years, the CEI has elaborated a specific working methodology combining multilateral diplomacy with a strong operational and result-oriented approach. Through its Executive Secretariat (CEI-ES) based in Trieste (Italy), the CEI administers funds and programmes supporting tangible regional actions implemented by various stakeholders in CEI Member States; at the same time, the CEI-ES directly participates in the implementation of several projects financed by the EU, thus joining multi-stakeholder partnerships engaged in addressing common challenges in various fields of work.

In order to ensure coherence between the priorities set by the CEI

governments and project activities, either funded or implemented by the CEI-ES, Member States adopt a Plan of Action elaborated on a tri-annual basis.
The current CEI Plan of Action 2018 – 2020 directly refers to the importance of "promoting international scientific cooperation and initiatives to support science diplomacy", taking into account that the former (international scientific cooperation) has become "an essential element of foreign policy", while the latter (science diplomacy) is "emerging as a useful tool to build bridges and strengthen relations".

Based on CEI's traditional support to scientific cooperation as an effective vector of soft power, and considering the intergovernmental nature of the Organisation, investigating into the concept of Science Diplomacy more in detail was a logical consequence.
The Ministers in charge of Science and Research of the CEI Member States, who gathered in Trieste on 13 December 2019, also politically endorsed this perspective. It is reflected in the unanimously adopted "Trieste Declaration on Science" where Science Diplomacy is singled out as a promising dimension of international relations.
The Declaration highlights that the CEI represents a well-established forum for dialogue, thus the appropriate framework where interactions between and among scientists, diplomats and policy makers can be facilitated, "with the goal to tackle complex, science-driven issues of common interest".
To do so, the Ministers encourage the CEI-ES to design actions and initiatives and to explore the concept of Science Diplomacy further, "including through the implementation of trainings, capacity building actions, research activities and networking".
Against this background, the report "Science Diplomacy in CEI Member States" shall be seen as a first step towards the implementation of the "Trieste Declaration on Science", as well as a contribution to the global conversation on Science Diplomacy, by bringing in the perspectives of the countries of Central, Eastern and Southeastern Europe.
Moreover, the report is functional to the elaboration and design of future activities and projects in the field of Science Diplomacy, for which an overall picture of the panorama in the CEI region is an essential prerequisite.

A final word shall be said on the Autonomous Region Friuli Venezia Giulia (FVG), which has enthusiastically accepted to fund this research activity, carried out by the University of Trieste – Department of Social and Political Sciences, in cooperation with the CEI-ES. The FVG Region is firmly committed to supporting internationalisation of research, capacity building and advanced training, thus to capitalising on the resources and strengths of the regional Science and Innovation System (SiS).
The geographical, historical and cultural projection towards Central, Eastern and Southeastern Europe, together with the long-

standing support to international scientific cooperation, ensure optimal framework conditions in order for the FVG Region to become a reference point for Science Diplomacy in Europe. In this framework, it is, therefore, necessary to expand the knowledge on this topic, while clearly understanding how Science Diplomacy works in practice across the CEI area.

Roberto Antonione
Secretary General
Central European Initiative

Table of Contents

1 Context and definition of Science Diplomacy

The disruptive effects of technological innovations that have marked the last couple of decades cannot be underestimated when analysing the International Relations (IR) field. The "mutual influence" (Kaltofen and Acuto, 2018: 8) between science and diplomacy is becoming more and more crucial in an international system characterised by globalisation, which implies interconnection and cooperation as regular behaviours among nations (Turekian et al., 2015: 3). Indeed, facing global multifaceted challenges – such as climate change, food security, health threats, migration, terrorism, water availability – requires a collective effort underpinned by scientifically valid solutions (Ibidem), (Flink and Schreiterer, 2010). Individual countries cannot solve nor tackle these phenomena alone. Therefore, multilateral and transnational alliances are needed. Furthermore, sharing information and knowledge with regard to science and technology (S&T) is crucial to conceive and deliver evidence-based policies (Simon, 2019). It is not by chance that an increasing number of countries is eager to integrate S&T in their diplomatic tools (Flink and Schreiterer, 2010).

Consequently, it has been argued that the "globalizing world has eroded the old dichotomy between science and diplomacy and helped to facilitate the emergence of science diplomacy" (Flink and Schreiterer, 2010: 3). Indeed, although rooted far in the past, Science Diplomacy (SD) is a relatively new concept that has emerged in the 2000s. According to Ruffini, SD is placed "in the particular field of international relations where the interests of science and those of foreign policy intersect".

For the purpose of this paper, both the concept of science and diplomacy are intended in their broad and comprehensive meaning, as reported by Turekian and his co-author. On the one hand, science is considered as a universal language based on rationality, transparency and non-ideology (Royal Society, n.d.).
It is "a form of knowledge acquisition [...] founded upon empirical methods of experimentation and repeated verification of results" (Turekian et al., 2015: 4). On the other hand, as former UN Deputy-Secretary General Louise Frechétte put it, "diplomacy is an art, not a science. Once one has mastered the history, studied the norms, understood the institutions, and figured out the players, there is one last, crucial lesson to learn. It has to do with the very human dimension of diplomacy. Diplomacy is about persuasion, not coercion.

It is about looking for and finding common ground, about forging agreement and achieving a balance of benefits that will allow each party to go home with at least some degree of satisfaction" (Fréchette, 2013: xxxiii).
Unlike borderless science, diplomacy – as a "non-violent approach to the management of international relations characterized by dialogue, negotiation and compromise" (Turekian et al., 2015: 4) - originates from the division of global space into sovereign nations. It is, therefore, a national issue based on the interests of governments. At first sight, this might clash with Miller's definition of "science diplomacy as an urgent, arguably, inevitable strategy for governments to continue 'to serve the global public good'" (cited in Kaltofen and Acuto, 2018: 10). However, if we consider today's world as a more interrelated system where the Westphalian order is challenged by an increased interconnection, it can be argued that "scientific collaborations among nations are necessary to tackle increasingly common challenges" (Turekian et al., 2015: 3). This precisely explains the new interest in the role of science in IR.

Several definitions, sometimes conflicting and ambiguous, have been provided for the expression "Science Diplomacy". The one that better fits the aim of this research expands Fedoroff's definition (Fedoroff, 2009) and affirms that:

> "Science diplomacy is the process by which states represent themselves and their interests in the international arena when it comes to areas of knowledge – their acquisition, utilization and communication – acquired by the scientific method. It is a crucial, if under-utilized, specialty within the diplomatic constellation that can be used to address global issues, enhance co-operation between countries and leverage one country's influence over another (Turekian et al., 2015: 4-5)."

In line with the definition given by Ruffini, we believe SD is more than a policy tool or a policy domain: "a country's science diplomacy refers to all practices in which actions of researchers and of diplomats interact" (Ruffini, 2017: 16-17). Moreover, this study embraces the three-fold typology conceptualised by the Royal Society and the American Association for the Advancement of Science (AAAS) that consider SD as having three main dimensions: "informing foreign policy objectives with scientific advice (science in diplomacy); facilitating international science cooperation (diplomacy for science); using science cooperation to improve international relations between countries (science for diplomacy)" (Royal Society, n.d.: 32). In other words, SD entails a bidirectional relation where diplomacy is used as a tool to bring scientific progress, while science is a facilitator to overcome deadlocks in traditional diplomatic relations (Ibidem). Finally, it is essential to clarify that SD differs from international scientific cooperation since it does not focus on scientific advancements as such, and is included in a broader strategy of national or international foreign policy objectives (Turekian et al., 2015).

2 Relevance and aim of the study

Although it is gaining ground, especially in the United States (US), Science Diplomacy (SD) remains inadequately explored as demonstrated by the scarcity of related literature (Rungius, 2018), (Langenhove et al., 2017). Nevertheless, the European Union (EU) has funded a few projects investigating into the connection between science and foreign policy, such as "S4D4C – Using science for/in diplomacy for addressing global challenges" that aims at analysing the state-of-the-art of European SD and at proposing ways of strengthening it (Rungius, 2018). Moreover, the EU is starting to hire S&T experts for its External Actions Service (EEAS) as well as to address specific cross-border topics (Flink and Schreiterer, 2010).

However, despite the increasing interest in SD, a comprehensive conceptualisation of the expression is still lacking along with a typology describing common features. Some studies (Flink and Schreiterer, 2010), (Berg, 2010) have analysed national approaches to SD concluding that no benchmark model was definable due to overly marked differences (Rungius, 2018). However, only a few countries were investigated and compared (Germany, France, Switzerland, UK, Japan, the US and, to some extent, the EU), without taking into account Central, Eastern and Southeastern European countries.

Therefore, the aim of this research project is to explore the state and prospects of SD in this broad portion of Europe, focusing on the Member States of the Central European Initiative (CEI), a regional intergovernmental forum encompassing Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, Italy, Moldova, Montenegro, North Macedonia, Poland, Romania, Serbia, Slovakia, Slovenia and Ukraine. The ultimate objective of the research is to provide a first overview able to map how SD is approached by these countries.

To this end, the following sections 3, 4 and 5 are outlined as follows: section 3 provides an overview of the existing classifications of national approaches to SD based on a comprehensive review of the literature; section 4 mainly focuses on national approaches to SD in Central, Eastern and Southeastern Europe. In this respect, a mapping exercise has been conducted based on existing literature combined with the results of the surveys carried out in CEI Member States; section 5 analyses policy implications that can be drawn from the outcomes of the research. Finally, the conclusions recap the proposed tentative typology and reflect on possible practical suggestions.

3 National approaches to Science Diplomacy

As mentioned in section 2, despite the growing interest in the study and practice of Science Diplomacy (SD), "[there] are only a few studies and resources that explicitly investigate national science diplomacy approaches" (Rungius 2018). Furthermore, the existing analyses of national approaches to SD showcase three main weaknesses: (1) a limited number of countries has been investigated; (2) the examined countries are overall homogeneous in terms of economic performance (Germany, France, Switzerland, UK, Japan, the US are all advanced industrial economies) (e.g. (Ruffini, 2017), (Flink and Schreiterer, 2010), (Flink and Rüffin, 2019); (3) only specific initiatives and experiences are taken into account without considering the general context (e.g. (Dolan, 2012).
Nevertheless, most of the studies that are present in the literature account for the diversity and even tensions that exist in the ways SD is institutionalised and works in practice. Such diversity reflects the different goals, scopes, and instruments used at national and international level to implement SD actions.

The first source of diversity identified through this study builds on the work of (Flink and Schreiterer, 2010) and focuses on the objectives that one country may try to attain through SD. In particular, they make a distinction between: (1) access to research capacities (scientists), facilities and results; (2) promotion of a country's achievement in RTD as "part of a nation's global marketing" (Flink and Schreiterer, 2010: 669); (3) influence on other countries' public opinion, and political and economic leaders, as part of a country's display of "soft power". Undoubtedly, the above-listed goals refer to the national sphere, especially because knowledge and knowledge production are viewed as the key source of a nation's prosperity. Consequently, considering the dual nature of SD activities residing in both national interests and international collaboration, we can argue that tension is produced between these two levels (national interests and international collaboration). In particular, this tension originates from the perceived trade-off between fostering international scientific cooperation, on the one hand, and building a competitive advantage in the R&D domain, on the other.
A possible solution to this tension has been found in the broadening of the "foreign policy rationale of advancing 'national interest' [...]" to include international and global challenges, which are multilateral in nature. SD has been seen as a way of jointly responding to such

challenges (Kaltofen and Acuto, 2018), 9). In other words, while "[for] a country to make any investment that supports science diplomacy, the actions must be seen to either directly or indirectly advance its national interest", the notion of national interest can be described according to motivations and intervention logics embracing cooperation and multilateralism (Turekian, 2018). Following this logic, Turekian, Gluckman, Kishi, and Grimes (Ibidem) identify three goals of SD: (1) actions designed to directly advance a country's national needs, including areas such as national influence and reputation, assistance and development aid, security, economic development and innovation, capacity building; (2) actions designed to address cross-border interests, including areas such as large research infrastructures and services, standard settings and licensing for transnational economic activities; (3) actions primarily designed to meet global needs and challenges, including areas such as shared/global challenges (e.g. the Sustainable Development Goals - SDGs of the UN Agenda 2030) and the governance of physical and cyber spaces which are not under public jurisdiction (e.g. outer space). In his comparative analysis of national approaches to SD, Ruffini (Ruffini, 2017) provides a long list of priority areas of SD activities that loosely reflect the more systematic classification of Turekian and his co-authors. The identified priorities are the following: trade and business, innovation, academic and public research, environmental and other global issues.

The second source of diversity is based on the different institutional set up of a country's SD activities, i.e. what Ruffini calls "the diplomatic apparatus" (Ruffini, 2017: 47). Such a set-up is as diverse as the SD goals themselves, encompassing: (1) the presence or absence of SD in national Science, Technology and Innovation (STI) Strategies; (2) the models of coordination between national ministries; (3) the size and geographical distribution of official and "track II" diplomatic networks; (4) the number and types of S&T international agreements. Despite such a diversity, there are also commonalities: "two [government] departments are on the front line: the Ministry of Foreign Affairs and the Ministry in charge of research" (Ruffini, 2017: 75).
Despite the fact that, as an almost general rule, scientific and technological networks are usually set up, financed and supervised by the Ministry of Foreign Affairs, SD seems to exceed the national boundaries of traditional diplomacy. Indeed, observers see the emergence of SD as a consequence of the intersecting trends of denationalisation of diplomacy and the internationalisation of science (Flink and Rüffin, 2019). Current institutional models attempting this integration are not immune from tensions between central attempts to outline and impose balanced strategies and responsiveness of individual outposts to adapt flexibly to local contexts, including in the degree of involvement of STI stakeholders in the formulation and implementation of SD activities. As noted by Rüffin, the "'[widening] gaps between individual outposts' interests and approaches", on the one hand, and centralised directives from

MFAs “threaten cohesion, thrust, and identity of the organisation and may even weaken its work’s impact” (Rüffin, 2018: 14).

A third source of diversity is related to the degree to which SD embraces a broader concept of innovation. The focus on innovation is by no means limited to SD. Instead, it corresponds to a broader shift in the focus of public policies and private investments away from “scientific knowledge, to technology [...], to the capacity to increase opportunities for innovation (social and economic value creation through new goods, services and systems)” (Leijten, 2017: 1). Traditionally focused on international scientific collaboration, this reorientation towards innovation is not without consequences: “with the growing importance of knowledge driven innovation as a growth factor in the economic, competitive thinking is becoming more influential in the field” and SD is increasingly seen as a tool to foster national innovation systems (Ibidem, 2, 10), making the boundaries with economic diplomacy fuzzy and contributing to building a national competitive advantage in trade, investment, technology, etc. through diplomatic means.

Furthermore, the shift toward innovation modifies the traditional stakeholder configurations of SD: as the production of scientific knowledge comes closer to the context of its application, the role of stakeholders increases beyond the traditional view of “track II” diplomacy, to gain a role in the coproduction of policies (Carayannis and Campbell, 2011). This emphasis on innovation prompted the rise of “an integrative narrative. Science and Innovation Diplomacy (S&ID) is meant to simultaneously contribute to economic growth, improved international relations, and the advancement of science”, though practice still seems to be guided by the classic, linear model of innovation on a continuum of activities, from basic, fundamental research, to the application of new scientific insights to turn them into new business opportunities (Rüffin, 2018: 16).


M1
90
1.25

4 Methodology

The goal of this report is to explore national approaches to Science Diplomacy (SD). Our specific focus is on the large part of Europe covered by the membership of the Central European Initiative (CEI), which, until now, had been mostly ignored within the activities aimed at exploring national approaches to SD (see previous section). This investigation is based on a survey carried out by officials of CEI Ministries of Foreign Affairs between September and November 2019. The presentation of its results is organised in three sections dealing with specific subtopics:

- **organisation of SD activities at national level**, focusing on the organisation of SD in the Ministry of Foreign Affairs (MFA), the type and degree of interministerial coordination, the goals pursued by SD activities;
- **diplomatic tools for international science and technology cooperation**, focusing on the diplomatic instruments and activities used in promoting international collaboration in STI, such as deployed attachés, cooperation agreements and other joint initiatives, participation of science stakeholders (e.g. universities) in international collaboration networks;
- **developing SD capabilities in CEI Member States**, focusing on the integration of SD in national innovation strategies, on the actions and partnerships needed to strengthen a country's capacity in the field, and on priority topics for such a development.

In total, 11 out of 17 CEI countries completed the survey, namely Albania, Belarus, Czech Republic, Hungary, Italy, Montenegro, North Macedonia, Poland, Romania, Serbia and Slovakia. As an initial attempt to map the SD reality in Central, Eastern and Southeastern Europe, this research has a preliminary nature. In particular, we are aware of the fact that the concept of SD, albeit still relatively ill- defined, is emerging in, and partially as a result of, a context which is characterised by "a more networked, relation and collaborative way of interacting in international affairs that reaches well beyond the classical practices of foreign ministries" (Flink and Rüffin, 2019). While we can collect information about these complex interactions and collaborations from the existing literature, the survey was primarily designed to explore the activities of MFAs in SD. Indeed, we aimed at gathering data regarding the countries' activities and agenda in interstate cooperation, in order to assess the degree of institutionalisation of SD (Turekian, 2018).

5 Results

5.1 Respondents

MFA officials from eleven (11) CEI Member States answered the questionnaire: Albania, Belarus, Czech Republic, Hungary, Italy, Montenegro, North Macedonia, Poland, Romania, Serbia and Slovakia. The questionnaire was administered online over a three-month period, from September to November 2019.
Overall, all respondents have an academic background in the social sciences and the humanities, with most of them saying they had received training in Diplomacy and international relations (5) and Classics (3). Two respondents had received training in Economics and Management (1) and Literature (1), while one refused to answer this question. In terms of their professional seniority in Science Diplomacy (SD), the panel is equally distributed among junior (4), mid-career (3), and senior (4) professionals, respectively with 0 - 4, 5 - 9, and 10+ years of professional experience.

5.2 Organisation of Science Diplomacy activities at national level

As described in the methodology section, a first part of the questionnaire aimed at exploring the institutionalisation of Science Diplomacy (SD) in CEI Member States.
A first element examined in the survey was the use of the expression "science diplomacy" in the diplomatic/political terminology. Results show that this notion is used in the overwhelming majority (9) of the countries participating in the survey and, in the same number of countries, international scientific cooperation is discussed in the national science and innovation strategy.

From an organisational point of view, the survey shows that the management of SD activities is conducted by a variety of MFA Departments, as Table 1 illustrates.

Table 1.
MFA directorate/department responsible for international scientific cooperation.

Directorate/department	Frequency
Economic diplomacy directorate/department	0
Cultural diplomacy directorate/department	1
Science and technology directorate/department	3
Public diplomacy directorate/department	1
Other directorate/department	2
Shared responsibility of more departments	2
None of the above	2
Total	**11**

SD policies are managed by one unit/office within these directorates/departments. In general, it is interesting to notice that, despite the rhetoric and policies fostering the economic impact of knowledge creation, SD is part of the portfolios of departments not having a direct economic mission (with the partial exception of that MFA where SD activities are managed by the "Directorate for the promotion of the national system"). In one case, the Government has appointed a diplomat who is explicitly tasked to manage this policy portfolio and who has the position of "Ambassador at Large for Science and Innovation".
The number of staff units involved in SD varies significantly, ranging from zero (2) to more than 10 MFA officials (2) assigned to SD-related offices and activities. However, in most of the countries that were surveyed, the units in charge of SD are relatively small, involving six or less officers (8).

As science, technology and innovation crosscuts the responsibility of different government offices and institutions, the questionnaire investigated how international scientific cooperation is coordinated across the various governmental bodies that are involved in this policy area. Results confirm that these bodies regularly coordinate their activities in the field with a very frequent (9) or infrequent (2) recurrence. Yet, such a coordination mostly occurs on a "case by case" basis (6), while only in a minority of countries coordination is institutionalised either through the setting of specific objectives into a national strategy document (1) or by establishing a permanent inter-ministerial committee/working group between the MFA and the Ministry in charge of science and research (4).

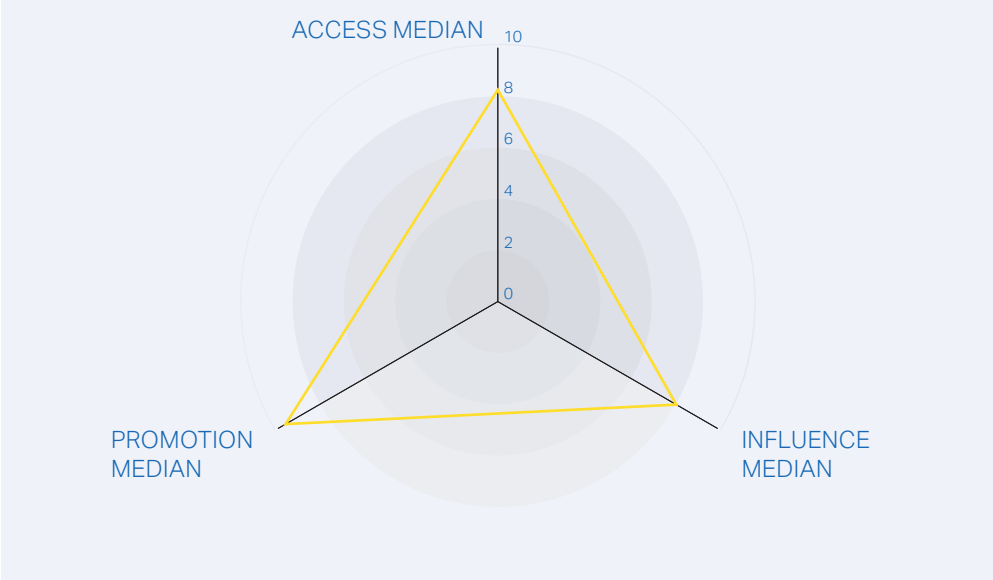
Finally, the questionnaire explored the motivations behind the investment in SD carried out by those CEI Member States involved in the survey. In order to examine their motives, respondents were asked to rate, on a 10-point scale, a set of 10 foreign policy objectives SD should contribute to. These objectives can be grouped in the three categories below, each of them followed by the list of relevant indicators included in the survey questionnaire:

1. **Influencing** other countries' public opinion, decision-makers and political or economic leaders;
   - ► Pooling scientific knowledge/research infrastructures for informing policy making
   - ► Easing tensions/building trust between States
   - ► Influencing cross-national policy making in topics of common interest
2. **Accessing** researchers, research findings and research facilities, natural resources and capital available abroad to improve national innovation capacity and competitiveness;
   - ► Seizing new markets, knowledge and key technologies
   - ► Attracting foreign talents and investments
   - ► Benchmarking international R&D trends and policies
   - ► Spotting new technologies, scientific discoveries and research potentials
   - ► Pooling knowledge/infrastructures for advancing scientific knowledge

3. **Promoting** the country's achievements in R&D as part of a nation's global marketing efforts.
   - ► Promoting national achievements in science, technology and innovation
   - ► Strengthening the national science system.

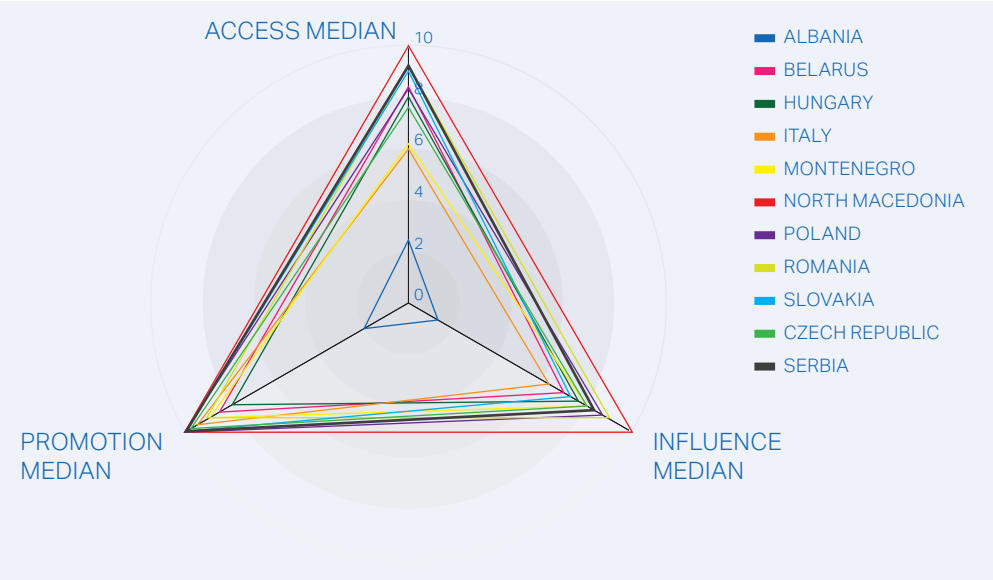
Looking at the median value of the distribution, respondents believe that SD should primarily contribute to promote the country's science and innovation system (9.5), and, to a lesser degree, serve both the objectives of accessing resources (8.2) and of exerting influence (8.0), as illustrated in Figure 1.

Figure 1.
Motivations of SD activities: Median Values.



As Figure 2 shows intuitively, the median value summarises a set of quite convergent responses offered by the respondents, with just one exception.

Figure 2.
Motivations of SD activities: distribution per country of respondents.



5.3 Diplomatic tools for international science and technology cooperation

A second part of the questionnaire focused on the diplomatic instruments and activities used in promoting international collaboration in STI, participation of science stakeholders (e.g. universities) in international collaboration networks. In summary, it was designed to map the international networks of scientific collaboration CEI Member States are part of.
In examining these networks, the questionnaire considered three instruments for the implementation of SD: a) the presence of scientific attachés assigned to the diplomatic missions of each country; b) the existence of active framework cooperation protocols/agreements in the field of Science and Technology (S&T); c) the implementation of other joint international initiatives, such as joint programmes, ad hoc funding instruments, working tables and groups.

Figure 3 combines three different maps representing, respectively, in which European countries the CEI Members States responding to the questionnaire have a scientific attaché in their embassies (Figure 3a), the countries which are part of bilateral agreements (Figure 3b), and the countries which are part of other joint initiatives (Figure 3c). See Appendix A for raw data.

Figure 3.
Diplomatic instruments for international science and technology cooperation: a focus on Europe.

Figure 3a.
Science attachés.

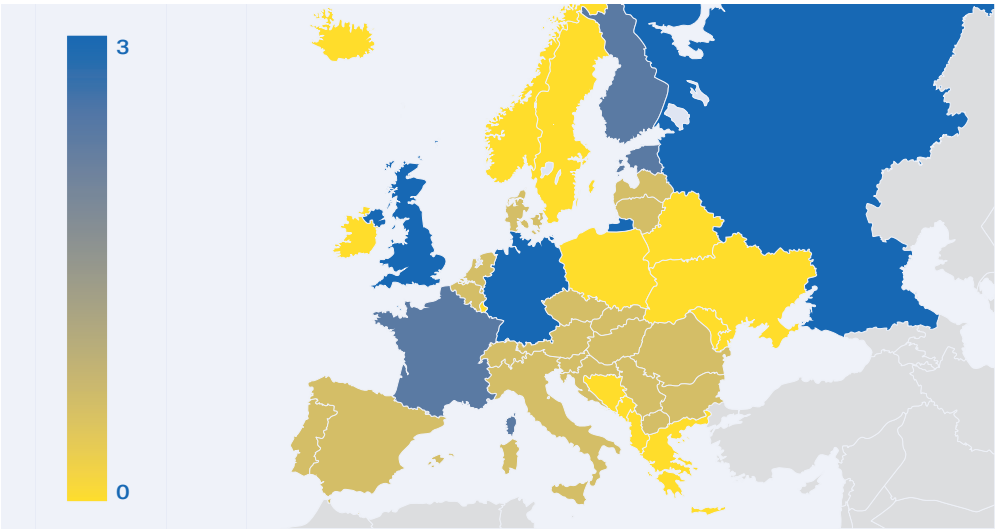


Figure 3b.
Bilateral cooperation agreement.

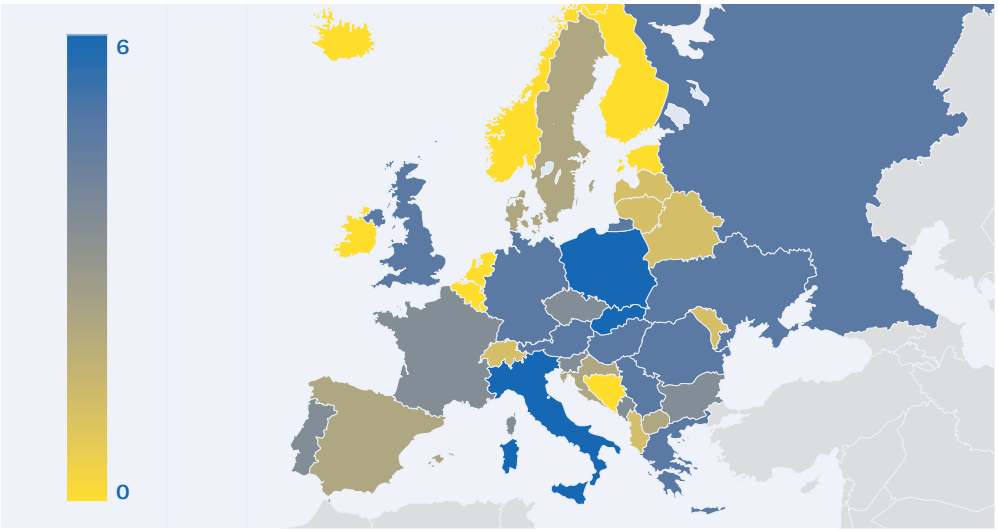
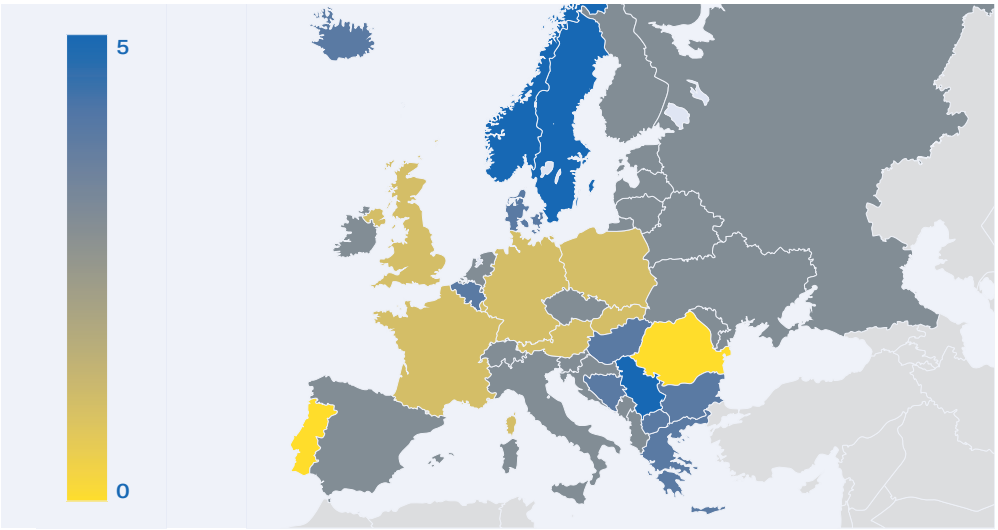


Figure 3c.
Other joint initiatives.

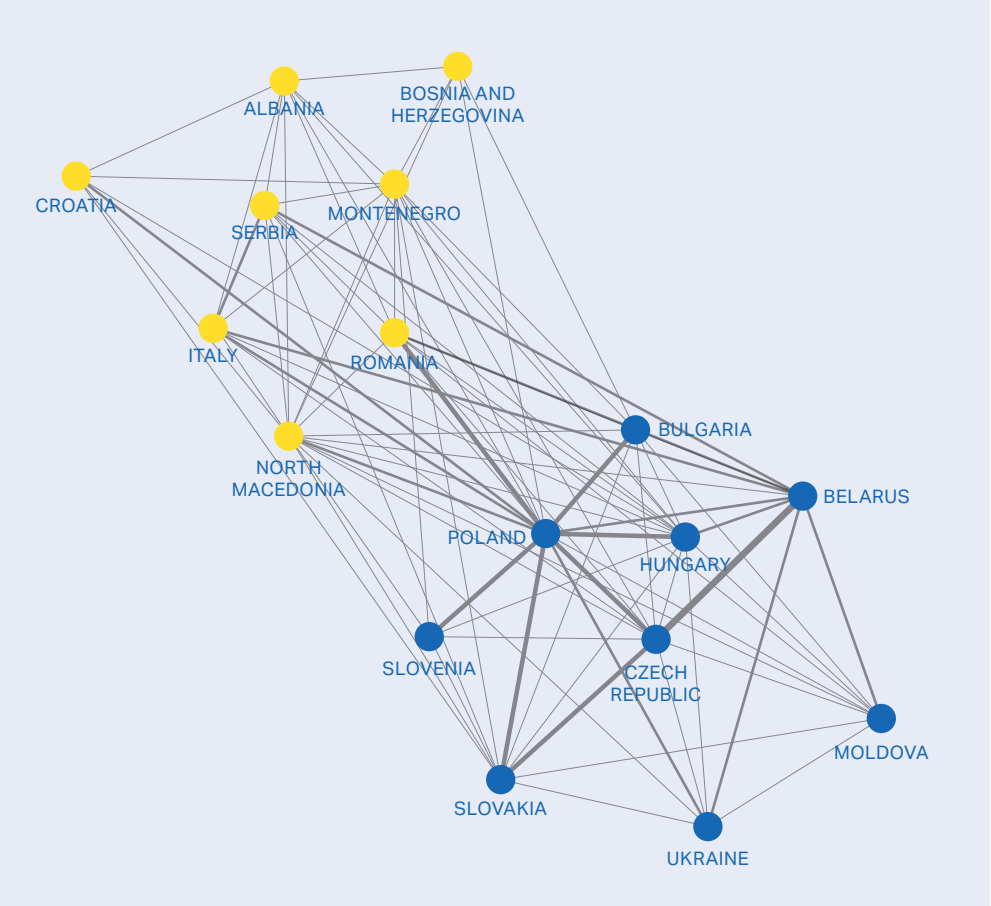


It is interesting to notice how the geographical distribution of these instruments differ. At a first glance, the diffusion of science attachés seems limited to a narrow number of countries, such as Germany, Russia and the United Kingdom, with 3 attachés, each from the CEI Member States participating in the survey. A broader network of relations is maintained through bilateral agreements and, to a lesser extent, through other joint initiatives. In particular, a careful analysis of the bilateral agreements, as reported by the survey respondents, show the existence of three attractive poles (Italy, Poland, and Slovakia). The maps also visibly illustrate the divergence between the Western Balkans and other CEI countries in terms of their capacity to establish international scientific agreements and collaborations, and the CEI Member States in the Western Balkans less involved in international cooperation, except for Serbia.

After completing this overview, we had a closer look at the international science cooperation among CEI Member States. To explore this aspect, we used network analyses in search of denser clusters of countries characterised by stronger ties within the overall CEI Member States' network and mapped their mutual links in terms of scientific attachés, bilateral agreements and other joint initiatives[1].
As illustrated in Figure 4, two groups of countries with a distinct geographical nature seem to emerge from this analysis. A first group includes eight (8) countries: Albania, Bosnia and Herzegovina, Croatia, Italy, Montenegro, North Macedonia, Romania, and Serbia. A second group comprises Belarus, Bulgaria, Czech Republic, Hungary, Moldova, Poland, Slovakia, Slovenia, and Ukraine (9).

1. For this analysis, we assigned an arbitrary value of 1 to each of the three instruments. Therefore, if two countries collaborate via a bilateral agreement and participate in other joint initiatives, the value assigned to their link is 2. If a scientific attaché is also present, then the value of their link is 3. We used the network analysis software Pajek to perform this analysis.

Figure 4.
Networks of international science collaboration among CEI Member States.



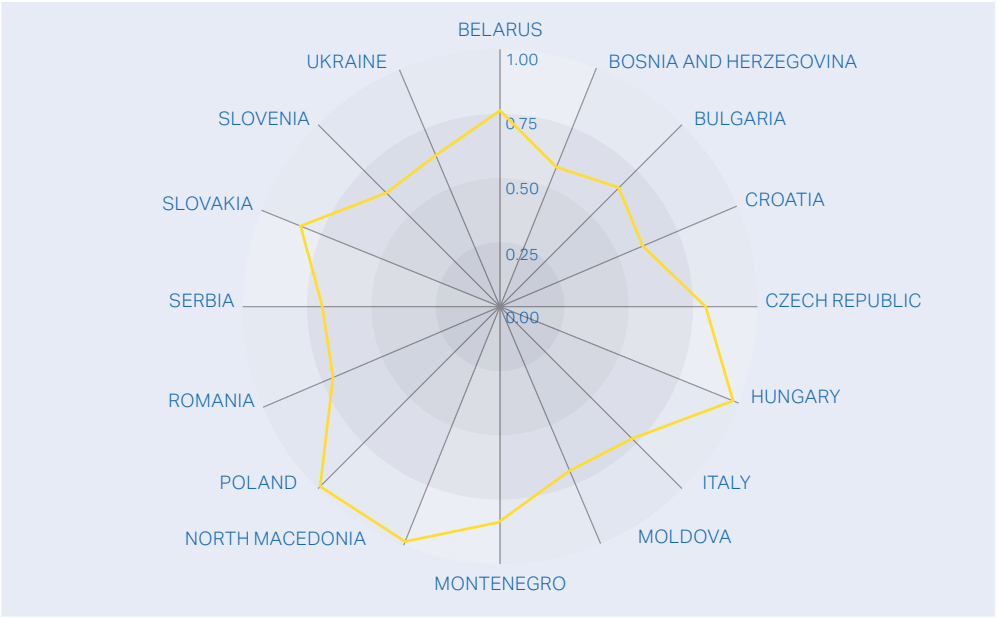
2. Subgroups were identified using the community detection algorithm available in the software Pajek.

While this result is contingent on the number of returned questionnaires (11 out of 17 CEI Member States have responded to the survey) and the distribution of connections could change had all CEI Member States responded to the survey, the result suggests that international cooperation is essentially regionalised, with two groups of countries broadly corresponding to South/Southeastern Europe, on the one hand, and to Central/Eastern Europe, on the other. See Appendix B for raw data[2].

3. The metric we are using to calculate the network's nodes centrality is called "relative closeness centrality". The calculation of centrality is a function of the Pajek software mentioned above. The network was treated as binary to compute the centrality measure.

We can also determine which countries are most central in these networks, i.e. those which are closer to other units in the network. The radar chart below graphically illustrates the countries' centrality, using a metric ranging from 0 to 1: closer to 1 (in the chart: nearer to the radar's external border), the more central the node is in the network; closer to 0 (in the chart: nearer to the radar's centre), the less close the node is in the network[3].
Looking at the results, it is noticeable that Hungary, North Macedonia and Poland are the most central countries in the overall network of the CEI Member States, all of them with a score of 1. Nevertheless, this chart needs careful attention: the six CEI Member States, which did not return the questionnaires (Bosnia and Herzegovina, Bulgaria, Croatia, Moldova, Slovenia and Ukraine), are assigned a centrality value based on their mentions in the returned questionnaires only and this partial lack of data is liable to result in a lower value. See Appendix C for raw data.

Figure 5.
Centrality of CEI Member States in intra-regional cooperation network.

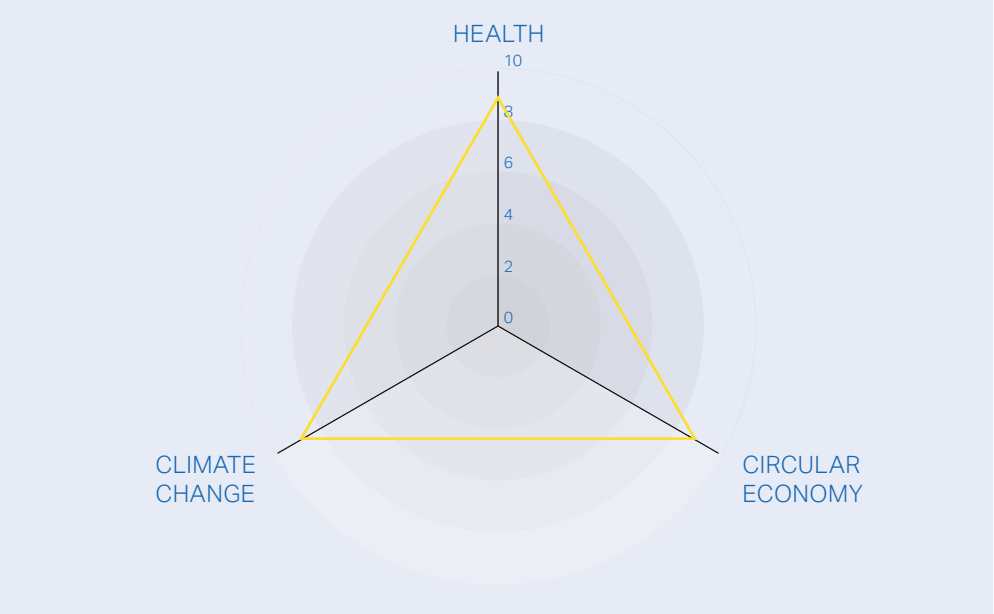


5.4 Developing science diplomacy capabilities in CEI Member States

The last part of the survey focused on the integration of SD in national innovation strategies, on the actions and partnerships needed to strengthen the country's capacity in the field, and on priority topics for such a development.
A first question aimed at establishing a link between CEI policies and international scientific cooperation. Respondents were asked to prioritise, on a 10-point scale, three thematic areas of international scientific cooperation (health, circular economy, climate change), which are included in the CEI Plan of Action 2018-2020. As shown in Figure 6, respondents considered equally important all three thematic areas, all of them with a median score of 9 each.

Secondly, the questionnaire asked to name which SD-related activities were considered useful to strengthen MFAs' capacities in the field. The majority of respondents (8) considered training of both scientists and diplomats the most important capacity building action , while networking events between the diplomatic and scientific communities was the second one (3). Capacity building overshadowed the third, alternative answer listed in the questionnaire, i.e. doing socio-political research to better understand SD concepts and impacts, as the group of practitioners responding to the questionnaire prioritised the need to train skilled "science diplomats" able to effectively tackle those global challenges having a strong scientific and technological component.

Figure 6.
Priority thematic areas for developing international scientific collaboration activities (1 = least important, 10 = most important).



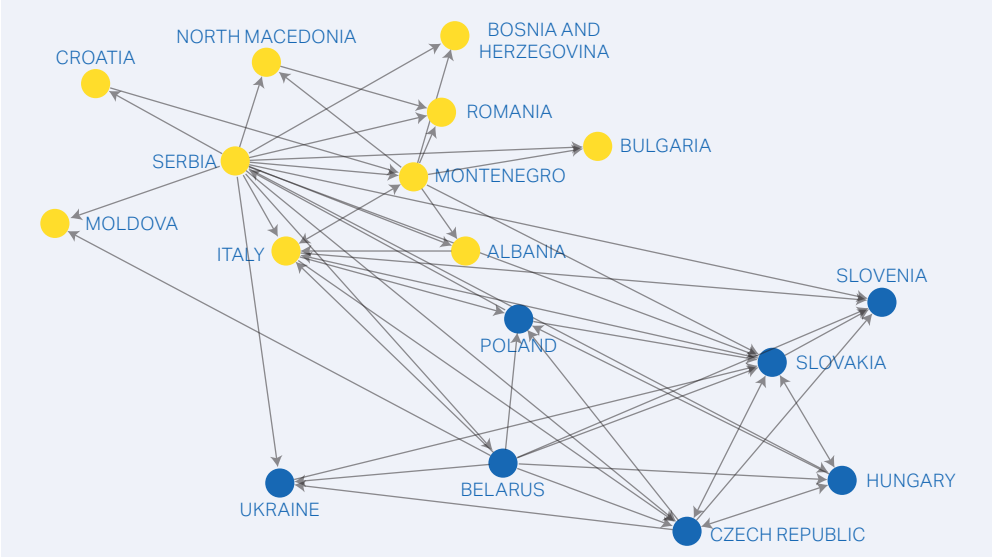
Moreover, respondents were asked to indicate which kind of project of international science cooperation their country would have been most interested in. As showed in Table 2, most respondents chose scientific collaborative projects, both bilateral (4) and multilateral (3). Other measures supporting scientific research attracted less interest, such as the construction and management of shared research and infrastructure (1) and the establishment of international mobility schemes for researchers (1). Finally, two (2) respondents indicated as their preference the establishment of scientific panels supporting decision-makers on transboundary issues of shared international interest (2).

Table 2.
International S&T project of interest.

Directorate/department	Frequency
Scientific collaborative projects (bilateral)	4
Scientific collaborative projects (multilateral)	3
Establishment of scientific panels supporting decision-makers on transboundary issues	2
Schemes for international mobility of researchers	1
Construction and management of shared research infrastructures	1
Total	**11**

Finally, respondents were asked to name which CEI Member States they considered priority partners for developing international collaboration activities in Science and Technology. Based on the nominations made by the respondents, a network of desired collaborations was drawn, as shown in Figure 7 (see Appendix D for raw data).

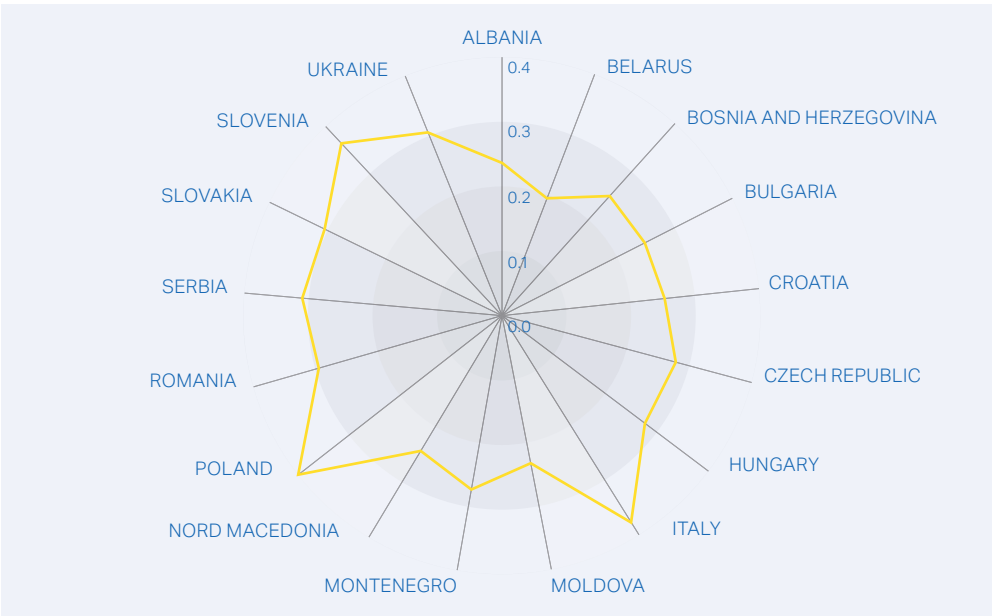
Figure 7.
Preferred partners for developing international collaborations in S&T.



If we compare the result with the networks built upon existing ties discussed above, we can see that the selection of partners largely reflects the division in geographical clusters outlined above, one gathering South/Southeastern European countries and the other Central/Eastern European Countries. Indeed, all countries were assigned to the same cluster as before, with one exception (Moldova). We then measured the centrality of units in the network again. Drawing a network based on the nominations (choices) of preferred partners adds a dimension of "directionality", which was absent in the analysis of existing ties presented above (see Figure 5). A "directed connection" between units means that one node points to the other but not necessarily the other way around. Accordingly, we decided to measure centrality in a different manner, considering the incoming ties for each unit only (the centrality or importance of units is determined by how many countries select them as partners, not by how many countries they select as partners). According to this new measure, we then ranked the countries from the most central to the least central in the network in a radar chart, as shown below in Figure 8 (see Appendix E for raw data)[4].

4.
The metric we are using to measure node centrality in this network is called "prestige" and was calculated using a function of the Pajek software mentioned above.

Figure 8.
Centrality of CEI MS in networks of preferred cooperation partners.



With the usual caveat (11 out of 17 CEI Member States returned the questionnaire and, therefore, results may be subject to change with a higher number of respondents), the results confirm the central place of Poland in these networks of cooperation, which in this case is followed by Italy and Slovenia.

6 Conclusions

Results suggest that the notion of Science Diplomacy (SD) is diffused in most of the surveyed countries and, as a consequence, in the majority of CEI Member States (MS). However, such a distribution does not correspond to a balanced institutionalisation of SD in the structure of the Ministries of Foreign Affairs (MFAs). In general, despite the emphasis in the literature on the economic dimension of science and innovation, SD seems most often located in MFA departments with a clear public and cultural mission, such as those responsible for culture and science. Moreover, while inter-ministerial coordination does exist and is frequent, such coordination is primarily achieved on a case-by-case basis, rather than by creating ad hoc offices, bodies or structured coordination mechanisms.

The promotion of national science systems and their achievements appears paramount in terms of motivations for implementing SD-related activities, though aspects such as gaining access to technologies, knowledge and market opportunities, as well as influencing policymaking are almost equally highly rated. Going back to the three goals of SD identified by Turekian, Gluckman, Kishi and Grimes (see section 3. National approaches to Science Diplomacy), one can declare that, across the CEI area, this almost identical weight assigned to these different motivations highlights the duality of SD, which is perceived as a tool both to pursue national interests, and to address transnational and multilateral needs and challenges.

Looking at the instruments of international scientific cooperation and the existing links those instruments helped establish within the CEI constituency, we have noticed that the collaboration between and among CEI countries is organised around two sub-regional clusters: countries from Central Eastern and Eastern Europe, on one side; countries from Southern and Southeastern Europe, on the other. This partition is reflected not only in the existing ties, but also in the preferred choice of partners in international scientific cooperation. Despite this differentiation, thematic priorities are quite similar across CEI Members, and health, circular economy and climate change are ranked equally high on a scale measuring the importance of these various policy areas. In this regard, it is interesting to note the alignment of policy priorities stemming from the participation in a multilateral forum, such as the CEI and, on a different scale, the EU, which adopts the same priorities.

The final comment regards the way forward: through the elaboration of this report, several aspects related to the concept of SD have emerged as possible areas of further research. However, we believe a step forward in the understanding of the SD functioning in the countries of Central, Eastern and Southeastern Europe would be an analysis of the stakeholders contributing - on different grounds and in various capacities - to the definition and implementation of SD lines of intervention. An attempt to define the governance of SD in CEI Member States, through a mapping of the main subjects involved in policy formulation and implementation, would complement this initial study, reaching out beyond the Ministries of Foreign Affairs to other governmental structures (first and foremost the Ministries in charge of science and research), as well as other key players such as universities, research organisations, learned societies, industries, civil society organisations, local and regional authorities, trade unions, etc. New models of structured coordination mechanisms beyond inter-ministerial collaboration are emerging, as an outcome of a more general shift in science policy towards stakeholder participation and as a consequence of the greater importance of subnational (regional) and transnational levels of governance. As the Science and Innovation System of the Region Friuli Venezia Giulia (SiS-FVG) shows, effective coordination mechanisms can involve the central/national level (Ministry of Foreign Affairs, Ministry of University and Research), the sub-national level (the Region Friuli Venezia Giulia) and a broad array of institutions active in the field of international science cooperation.

Finally, it is important to mention that respondents have clearly expressed an interest in building their institutional capacities in the SD field. In particular, training of both diplomats and scientists has been identified as the most important action needing promotion in the future in order to ensure the development of SD, with sure benefits in terms of a shared understanding of the policy implications of research activity, and, conversely, of the role of science in advising policy formulation and implementation. The creation of a training platform is, therefore, an essential tool to foster learning and sharing, thus boosting SD in CEI Member States and, at the same time, strengthening the links between the sub-regional groups of countries we mentioned above.

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Appendix A.
Diplomatic instruments for international science and technology cooperation: a focus on Europe

Country	N° of Science attachés	N° of Bilateral framework agreements	N° of Other joint initiatives
Albania	0	2	3
Andorra	0	0	3
Austria	1	5	2
Belarus	0	2	3
Belgium	1	1	4
Bosnia and Herzegovina	0	1	4
Bulgaria	1	4	4
Croatia	1	3	3
Czech Republic	1	4	3
Denmark	1	3	4
Estonia	2	0	3
Finland	2	1	3
France	2	4	2
Germany	3	5	2
Greece	0	5	4
Holy See	0	0	3
Hungary	1	5	4
Iceland	0	0	4
Ireland	0	1	3
Italy	1	6	3
Latvia	1	2	3
Liechtenstein	0	0	2
Lithuania	1	2	3
Luxembourg	0	0	2
Malta	0	1	3
Moldova	0	2	3
Monaco	0	0	3
Montenegro	0	4	3
Netherlands	1	1	3
North Macedonia	1	3	4
Norway	0	1	5
Poland	0	6	2
Portugal	1	4	1
Romania	1	5	1
Russian Federation	3	5	3
San Marino	0	0	3
Serbia	1	5	5
Slovakia	1	6	2
Slovenia	1	4	3
Spain	1	3	3
Sweden	0	3	5
Switzerland	1	2	3
Ukraine	0	5	3
United Kingdom	3	5	2

Appendix B.
Networks of international science collaboration among CEI Member States

	Albania	Belarus	Bosnia and Herzegovina	Bulgaria	Croatia	Czech Republic	Hungary	Italy	Montenegro	Moldova	North Macedonia	Poland	Romania	Serbia	Slovakia	Slovenia	Ukraine
Albania			1		1			1	1		1			1			
Belarus				1		2	2	2		2	1	2	2	2	2		2
Bosnia and Herzegovina																	
Bulgaria																	
Croatia																	
Czech Republic		1		1			1	1				1	1		1	1	1
Hungary	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
Italy									1			1		2		1	
Montenegro	1		1	1	1	1	1	1			1	1		1	1	1	
Moldova		1		1		1	1					1	1		1		1
North Macedonia	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1
Poland	1	1	1	3	2	3	3	2	1	1	2		3	1	3	2	2
Romania	1								1		1			1			
Serbia																	
Slovakia		1		1	1	1	1	1	1			1		1		1	1
Slovenia																	
Ukraine																	

Note: As explained in section 5.3, the figures in the table refer to the existence of ties between the countries in the form of: a) presence of scientific attachés; b) bilateral agreements for S&T cooperation; c) other joint initiatives.

Appendix C.
Centrality of CEI Member States in intra-regional cooperation network measured as Relative Closeness Centrality

Country	Relative Closeness Centrality
Hungary	1.000000
North Macedonia	1.000000
Poland	1.000000
Montenegro	0.842105
Slovakia	0.842105
Czech Republic	0.800000
Belarus	0.761905
Italy	0.727273
Albania	0.695652
Moldova*	0.695652
Romania	0.695652
Serbia	0.695652
Bulgaria*	0.666667
Slovenia*	0.640000
Ukraine*	0.640000
Croatia*	0.615385
Bosnia and Herzegovina*	0.592590

* These countries did not participate in the survey. Their centrality measure is, therefore, based on their mentions in the returned questionnaires only.

Appendix D.
Preferred partners for developing international collaborations in S&T

	Albania	Belarus	Bosnia and Herzegovina	Bulgaria	Croatia	Czech Republic	Hungary	Italy	Montenegro	Moldova	North Macedonia	Poland	Romania	Serbia	Slovakia	Slovenia	Ukraine
Albania								1									
Belarus						1	1	1		1		1		1	1	1	1
Bosnia and Herzegovina																	
Bulgaria																	
Croatia																	
Czech Republic							1	1				1		1	1	1	1
Hungary						1						1			1		
Italy									1			1		1		1	
Montenegro	1		1	1	1			1			1		1		1		
Moldova																	
North Macedonia													1				
Poland																	
Romania																	
Serbia	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1
Slovakia						1	1	1	1			1		1		1	1
Slovenia																	
Ukraine																	

Note: As explained in section 5.3, the figures in the table refer to the existence of ties between the countries in the form of: a) presence of scientific attachés; b) bilateral agreements for S&T cooperation; c) other joint initiatives.

Appendix E.
Centrality of CEI MS in the networks of preferred cooperation partners

Country	Centrality
Poland	0.400000
Italy	0.382813
Slovenia*	0.363636
Ukraine*	0.307692
Serbia	0.306250
Slovakia	0.306250
Romania	0.297794
Czech Republic	0.278409
Hungary	0.278409
Montenegro	0.278409
Bosnia and Herzegovina*	0.250000
Bulgaria*	0.250000
Croatia*	0.250000
North Macedonia	0.250000
Albania	0.235577
Moldova*	0.235294
Belarus	0.191406

* These countries did not participate in the survey. The centrality measure is, therefore, based on the preferred choices mentioned in the returned questionnaire only.

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